WHAT IS CLAIMED IS:

1. A semiconductor light-receiving device comprising:

a substrate that has a first surface and a second surface facing each other;

a first semiconductor layer that is formed on the first surface of the substrate and includes at least one semiconductor layer of a first conductivity type;

a light absorption layer that is formed on the first semiconductor layer and generates carriers in accordance with incident light;

a second semiconductor layer that is formed on the light absorption layer and includes at least one semiconductor layer of a second conductivity type;

a first electrode part that is electrically connected to the first semiconductor layer and applies a first potential thereto;

a second electrode part that is electrically connected to the second semiconductor layer and applies a second potential thereto; and

a third semiconductor layer of the second conductivity type that is interposed between the first surface of the substrate and the first semiconductor layer.

2. The semiconductor light-receiving device as claimed in claim 1, further comprising a capacitor that includes a p-n junction between the first semiconductor layer and the third semiconductor layer.

3. The semiconductor light-receiving device as claimed in claim 2, wherein the capacitor has a depletion-layer region that is formed at the p-n junction between the first semiconductor layer and the third semiconductor layer.

4. The semiconductor light-receiving device as claimed in claim 1, further comprising

a fourth semiconductor layer of the first conductivity type,

wherein the third semiconductor layer is interposed between the first semiconductor layer and the fourth semiconductor layer.

5. The semiconductor light-receiving device as claimed in claim 2, wherein the capacitor functions as a bypass capacitor that bypasses current flowing between the first semiconductor layer and the second semiconductor layer when carriers are generated in the light absorption layer.

6. The semiconductor light-receiving device as claimed in claim 1, wherein the first semiconductor layer includes a contact layer that is connected to the first electrode part and has a relatively high impurity concentration.

7. The semiconductor light-receiving device as claimed in claim 1, wherein the second semiconductor layer includes a contact layer that is connected to the second electrode part and has a relatively high impurity concentration.

8. The semiconductor light-receiving device as claimed in claim 1, wherein the first semiconductor layer includes a buffer layer having a relatively low impurity concentration.

9. The semiconductor light-receiving device as claimed in claim 1, wherein the second semiconductor layer includes a graded layer in which a plurality of semiconductor layers are stacked so that forbidden bandwidths vary smoothly.

10. The semiconductor light-receiving device as claimed in claim 1, wherein:

at least the light absorption layer and the second semiconductor layer form a mesa structure; and

light enters through a side surface of the light absorption layer that is exposed in the mesa structure.

11. The semiconductor light-receiving device as claimed in claim 10, further comprising an optical waveguide path that is provided on a side of the mesa structure and guides light into the light absorption layer.

12. The semiconductor light-receiving device as claimed in claim 10, wherein:

the first semiconductor layer has a surface exposed at the bottom of the mesa structure;

the first electrode part is formed on the exposed surface; and

the second electrode part is formed on the second semiconductor layer of the mesa structure.

13. The semiconductor light-receiving device as claimed in claim 1, comprising an avalanche diode.

14. The semiconductor light-receiving device as claimed in claim 1, wherein:

the first semiconductor layer includes an n-type InP layer; and

the second semiconductor layer includes a p-type InP layer.

15. The semiconductor light-receiving device as claimed in claim 1, wherein the light absorption layer is an InGaAs layer.

16. The semiconductor light-receiving device as

claimed in claim 1, wherein the third semiconductor layer is a p-type InP layer and has an impurity concentration of 1×10^{16} cm^{-3} or lower.

17. A semiconductor light-receiving device comprising:

a semiconductor substrate that has a first surface and a second surface facing each other;

a first semiconductor layer that is formed on the first surface of the semiconductor substrate and includes at least one semiconductor layer of a first conductivity type;

a light absorption layer that is formed on the first semiconductor layer and generates carriers in accordance with incident light;

a second semiconductor layer that is formed on the light absorption layer and includes at least one semiconductor layer of a second conductivity type;

a first electrode part that is electrically connected to the first semiconductor layer and applies a first potential thereto;

a second electrode part that is electrically connected to the second semiconductor layer and applies a second potential thereto; and

a capacitive element that comprises a dielectric material interposed between the first surface of the semiconductor substrate and the first semiconductor layer.

18. The semiconductor light-receiving device as claimed in claim 17, wherein the capacitive element includes a high-resistance semiconductor layer that is interposed between a pair of semiconductor layers of the first conductivity type.

19. The semiconductor light-receiving device as claimed in claim 5, wherein the same potential as the

second potential is supplied to the second surface of the substrate.

20. The semiconductor light-receiving device as claimed in claim 17, wherein the first semiconductor layer includes a contact layer that is connected to the first electrode part and has a relatively high impurity concentration.

21. The semiconductor light-receiving device as claimed in claim 17, wherein the second semiconductor layer includes a contact layer that is connected to the second electrode part and has a relatively high impurity concentration.

22. The semiconductor light-receiving device as claimed in claim 17, wherein the first semiconductor layer includes a buffer layer having a relatively low impurity concentration.

23. The semiconductor light-receiving device as claimed in claim 17, wherein the second semiconductor layer includes a graded layer in which a plurality of semiconductor layers are stacked so that forbidden bandwidths vary smoothly.

24. The semiconductor light-receiving device as claimed in claim 17, wherein:

at least the light absorption layer and the second semiconductor layer form a mesa structure; and

light enters through a side surface of the light absorption layer that is exposed in the mesa structure.

25. The semiconductor light-receiving device as claimed in claim 24, further comprising an optical waveguide path that is provided on a side of the mesa structure and guides light into the light absorption

layer.

26. The semiconductor light-receiving device as claimed in claim 24, wherein:

the first semiconductor layer has a surface exposed at the bottom of the mesa structure;

the first electrode part is formed on the exposed surface; and

the second electrode part is formed on the second semiconductor layer of the mesa structure.

27. The semiconductor light-receiving device as claimed in claim 17, comprising an avalanche diode.

28. The semiconductor light-receiving device as claimed in claim 17, wherein:

the first semiconductor layer includes an n-type InP layer; and

the second semiconductor layer includes a p-type InP layer.

29. The semiconductor light-receiving device as claimed in claim 17, wherein the light absorption layer is an InGaAs layer.

30. The semiconductor light-receiving device as claimed in claim 17, wherein the capacitive element functions as a bypass capacitor that bypasses current flowing between the first semiconductor layer and the second semiconductor layer when carriers are generated in the light absorption layer.

31. A semiconductor light-receiving device comprising:

a substrate that has a first surface and a second surface facing each other;

a first semiconductor layer that is formed on the

first surface of the substrate and includes at least one semiconductor layer of a first conductivity type;

a light absorption layer that is formed on the first semiconductor layer and generates carriers in accordance with incident light;

a second semiconductor layer that is formed on the light absorption layer and includes at least one semiconductor layer of a second conductivity type;

a first electrode part that applies a first potential to the first semiconductor layer;

a second electrode part that applies a second potential to the second semiconductor layer;

a metal layer that is formed on the second surface of the substrate and has a reference potential supplied thereto; and

a dielectric layer that is interposed between the metal layer and the second surface of the substrate.

32. The semiconductor light-receiving device as claimed in claim 31, comprising a module onto which the substrate is mounted, wherein the metal layer is electrically connected to the module and is supplied with the reference potential.

33. The semiconductor light-receiving device as claimed in claim 31, wherein the first semiconductor layer includes a contact layer that is connected to the first electrode part and has a relatively high impurity concentration.

34. The semiconductor light-receiving device as claimed in claim 31, wherein the second semiconductor layer includes a contact layer that is connected to the second electrode part and has a relatively high impurity concentration.

35. The semiconductor light-receiving device as

claimed in claim 31, wherein the first semiconductor layer includes a buffer layer having a relatively low impurity concentration.

36. The semiconductor light-receiving device as claimed in claim 31, wherein the second semiconductor layer includes a graded layer in which a plurality of semiconductor layers are stacked so that forbidden bandwidths vary smoothly.

37. The semiconductor light-receiving device as claimed in claim 31, wherein:

at least the light absorption layer and the second semiconductor layer form a mesa structure; and

light enters through a side surface of the light absorption layer that is exposed in the mesa structure.

38. The semiconductor light-receiving device as claimed in claim 37, further comprising an optical waveguide path that is provided on a side of the mesa structure and guides light into the light absorption layer.

39. The semiconductor light-receiving device as claimed in claim 37, wherein:

the first semiconductor layer has a surface exposed at the bottom of the mesa structure;

the first electrode part is formed on the exposed surface; and

the second electrode part is formed on the second semiconductor layer of the mesa structure.

40. The semiconductor light-receiving device as claimed in claim 31, comprising an avalanche diode.

41. The semiconductor light-receiving device as claimed in claim 31, wherein:

the first semiconductor layer includes an n-type InP layer; and

the second semiconductor layer includes a p-type InP layer.

42. The semiconductor light-receiving device as claimed in claim 31, wherein the light absorption layer is an InGaAs layer.